CLAIMS

1. A direct methanol fuel cell system comprising:

a direct methanol fuel cell including

an anode including an anode flow field plate;

a cathode including a cathode flow field plate;

a membrane electrode assembly including a protonically conductive membrane having first and second surfaces on which catalysts are disposed, anode and cathode diffusion layers disposed, respectively, on said catalysts;

a source of neat or concentrated methanol;

a pump coupled to said methanol source and said anode for pumping fuel to said anode flow field plate;

a conduit coupled to said methanol source and to one or more valves for delivering neat or concentrated methanol to a flow field provided by said anode flow field plate; and

a controller coupled to said one or more valves and, responsive to an increase in demand for output power from said fuel cell, operating to actuate one or more of said valves to allow neat or concentrated methanol to enter said flow field .

2. A direct methanol fuel cell system comprising:

a direct methanol fuel cell including

an anode including an anode flow field plate;

a cathode including a cathode flow field plate;

a membrane electrode assembly including a protonically conductive membrane having first and second surfaces on which catalysts are disposed, anode and cathode diffusion layers disposed, respectively, on said catalysts;

a source of neat or concentrated methanol;

a pump coupled to said methanol source and said anode for pumping fuel to said anode flow field plate;

a conduit coupled to said methanol source and to one or more valves for delivering neat or concentrated methanol to said anode diffusion layer, said conduit extending through said anode flow field plate into said anode diffusion layer; and

a controller coupled to said one or more valves and, responsive to an increase in demand for output power from said fuel cell, operating to actuate one or more of said valves to allow neat or concentrated methanol to reach said anode diffusion layer.

3. A diffusion layer for use in a direct oxidation fuel cell comprising:

a layer of material having a first surface which is oriented to receive fuel and a second surface from which diffused fuel passes, said layer including one or more apertures extending from said first surface to said second surface, said one or more apertures for allowing neat or concentrated fuel to effectively bypass said diffusion layer.

4. The diffusion layer as in claim 3 wherein said one or more apertures are connected by one or more conduits and one more valves to a source of fuel.

5. The diffusion layer as in claim 3 wherein said one or more apertures are lined with a material which is substantially impermeable to said fuel, thereby inhibiting said fuel from migrating laterally into said diffusion layer.

6. A membrane electrode assembly for use with a direct oxidation fuel cell, said assembly comprising:

a protonically conductive membrane having first and second surfaces on which catalysts are disposed;

anode and cathode diffusion layers disposed, respectively, on said catalysts, said anode diffusion layer having a first surface which is oriented to receive fuel and a second surface in contact with said catalyst, and one or more apertures extending through the thickness of said anode diffusion layer, said one or more apertures for allowing neat or concentrated fuel to effectively bypass said diffusion layer.

7. The membrane electrode assembly as in claim 6 wherein said one or more apertures are connected by one or more conduits and one more valves to a source of fuel.

8. The membrane electrode assembly as in claim 6 wherein said one or more apertures are lined with a material which is substantially impermeable to said fuel, thereby inhibiting said fuel from migrating laterally into said diffusion layer.

9. A direct methanol fuel cell comprising:

an anode;

a cathode;

a membrane electrode assembly including a protonically conductive membrane having first and second surfaces on which catalysts are disposed, anode and cathode diffusion layers disposed, respectively, on said catalysts, said anode diffusion layer having a first surface which is oriented to receive fuel and a second surface in contact with said catalyst, and one or more apertures extending through the thickness of said anode diffusion layer, said one or more apertures for allowing neat or concentrated fuel to effectively bypass said diffusion layer.

10. The direct methanol fuel cell as in claim 9 wherein said one or more apertures are connected by one or more conduits and one more valves to a source of fuel.

11. The direct methanol fuel cell as in claim 9 wherein said one or more apertures are lined with a material which is substantially impermeable to said fuel, thereby inhibiting said fuel from migrating laterally into said diffusion layer.

12. A direct methanol fuel cell system comprising:

a direct methanol fuel cell including

an anode;

a cathode;

a membrane electrode assembly including a protonically conductive membrane having first and second surfaces on which catalysts are disposed,

anode and cathode diffusion layers disposed, respectively, on said catalysts, said anode diffusion layer having a first surface which is oriented to receive fuel and a second surface in contact with said catalyst, and one or more apertures extending through the thickness of said anode diffusion layer, said one or more apertures for allowing neat or concentrated fuel to effectively bypass said diffusion layer;

a source of neat or concentrated methanol;

a pump coupled to said methanol source and said anode for pumping fuel to said anode;

a conduit coupled to said methanol source and to one or more valves for delivering neat or concentrated methanol to said apertures in said anode diffusion layer; and

a controller coupled to said one or more valves and, responsive to an increase in demand for output power from said fuel cell, operating to one or more of said valves to allow neat or concentrated methanol to flow through said apertures.

13. The system as in claim 12 wherein said one or more apertures are lined with a material which is substantially impermeable to said fuel, thereby inhibiting said fuel from migrating laterally into said diffusion layer.

14. A method of rapidly increasing output power from a direct oxidation fuel cell, said method comprising the steps of:

providing a source of neat or concentrated fuel;

providing a conduit and one or more associated valves between said fuel source and an anode diffusion layer in a direct oxidation fuel cell, said layer having more apertures extending through the thickness of said layer;

sensing a demand for output power from said fuel cell;

in response to an increase in demand for power, opening or more of said valves whereby neat or concentrated fuel passes through said apertures and is applied to a protonically conductive membrane.